Nordic climate change: data for modeling vector borne diseases

Kristensen, Birgit; Bødker, Rene

Publication date:
2011

Abstract (Poster) for Satellite symposium on the 13th April 2011 titled "Bluetongue and other vector borne diseases"

Title: Nordic climate change: data for modeling vector borne diseases.

Theme: Bluetongue and other vector borne diseases or alternatively Epidemiology and Surveillance

Keywords: Climate; Nordic; Modeling; Diseases; Vector borne;

Authors: Birgit Kristensen, René Bødker

National Veterinary Institute, Bülowsvej 27, 1790 Copenhagen V., Denmark (bkri@vet.dtu.dk)

Content:

The distribution of vector species is generally restricted by a range of different climatic and geographical factors, while the development and spread of the vector-borne diseases (veterinary and zoonotic) is often primarily temperature driven. Thus temperature and its derivatives are key factors in the modelling of vector-borne diseases. This puts a high demand on the quality and accuracy of the temperature data to be used as input in such models. In order to best capture the local temporal and spatial variation in the temperature surfaces, accurate daily temperature data were used in the present project.

Temperature data for a 30 year period (1980-2009) were obtained directly from the Meteorological stations in the five Nordic countries. The temperature data consisted of daily min and max measurements from 200 climate stations, adding up to more than two million measurements. Temperature point-data were interpolated to daily climate surfaces, using a squared IDW method. In the absence of a more local lapse rate the generally accepted lapse rate of -0.006 C˚/m was used to account for the relationship between temperature and altitude. The interpolation was carried out on temperatures at sea-level and subsequently adjusted for the altitude. As a spherical adjustment, the min and max temperature was interpolated on a grid with a spherical surface geometry. This ensures a more accurate estimate of the temperature isolines in the northernmost areas (above the Arctic Circle) of Scandinavia. Various temperature derivatives were calculated in order to assess the geographical and seasonal variation in the area.

In order to evaluate the response of vector borne diseases to possible future climate changes and the subsequent potential spread into new areas, daily temperature predictions (mean, min and max) for three 20-year periods and 7 different prediction models were obtained from the Danish Meteorological Institute (DMI). Predicted temperature scenarios for year 2040 and 2060 were calculated and the data were incorporated in various models.

Additionally, major geographical, topographical, husbandry and biological spatial parameters relevant to the distribution of vectors were included in the database and used as input in various distribution models.

All collected datasets were assembled in a gridded climate database and presented at the website, www.nordrisk.dk. The website was created with the purpose of presenting the data to the public and making the data available to research projects in the Nordic countries. The website consists of an interactive web-application linked to a summarized climatic database. This allows for interactive selection of summary data for display. Detailed data files are available for research projects on request.